Report

Introduction:

Backstory:

Education is important to society because it nurtures human talents for the sake of progress and innovation. Furthermore, poor education leads to costs in the form of lower income, worse life outcomes, poor economic growth, and higher costs in healthcare, social services, and increased crime. Thus, investment into education and making sure it works for everyone ensures better outcomes for everyone.

Equality is the general idea of impartiality, that all students should have the same access to education and are held to the same standards and objectives. However, equality does not account for the many variables that affect student outcomes, such as differences in wealth, family situation, possessions, social, racial, geographic background, and special educational needs.

On the other hand, educational equity is based on the idea of fairness in distributing resources and opportunities for each student based on their circumstances. Equity means that differences in educational outcomes are not the result of differences in wealth or family situations.

In the United States, equity in education is a big issue. Because educational funding comes from primarily taxes within that school district, the income level of people living in the community can vastly affect educational funding and resources. This results in poor children, who often need the most assistance, being placed in low performing schools with less funding and resources to get people the help they need to succeed.

In this project, we aim to investigate educational equity in school districts in New York State. Using graduation rate as a metric for educational outcomes, we aim to analyze graduation rate compared to the district's student body information and financial status. Student body information includes total enrollment, percentage of minority students, percentage of graduation and dropout rate. Financial status includes federal funding status, funding per student, and median household income for that district.

Exploratory questions:

1. Which districts have the most funding per student and what differentiates them from the other districts? Is there a difference in graduation rate for these districts compared to the ones that don't receive as much funding?
2. What is the percentage of districts that get federal funding vs ones that do not? How do the districts that received federal funding compare to the ones that didn't?
3. What kind of correlation is there between the graduation rate and the other factors we've acquired?
4. Is there a discrepancy between the graduation rate and the percentage of minority students in a district?
5. Can we predict the graduation rate for a district based on the data and which factor has the most effect on the graduation rate for a school district?

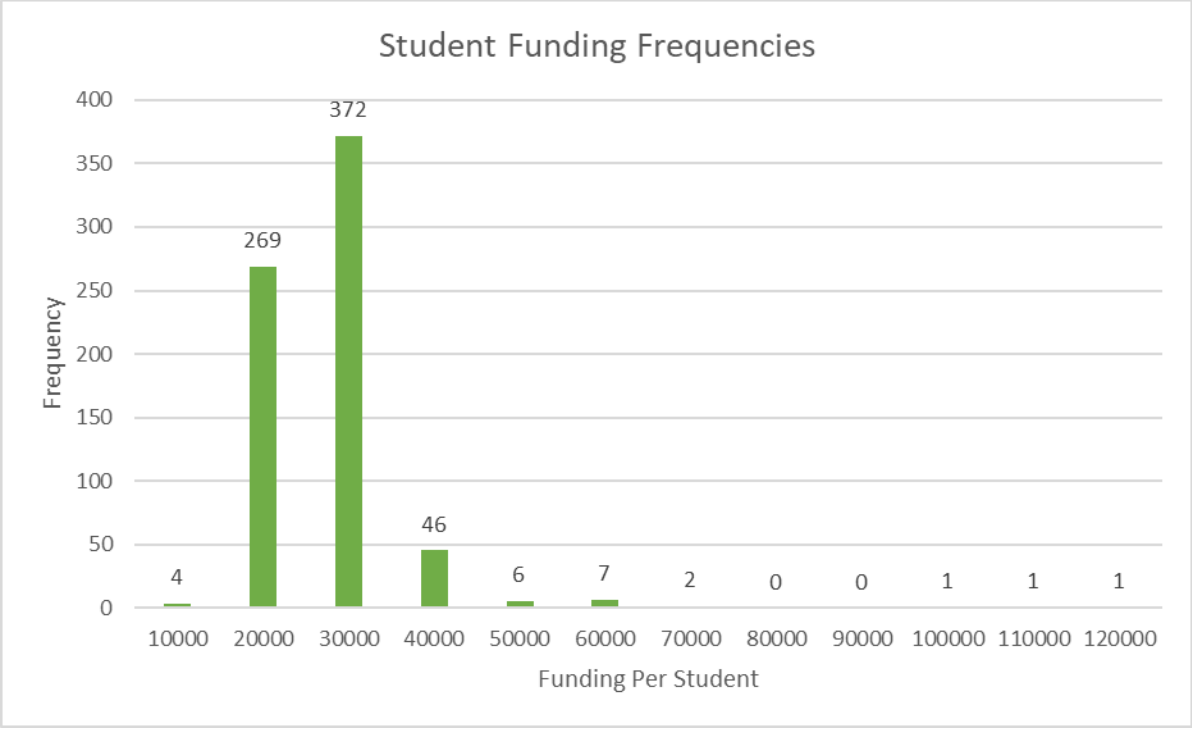
Research:

Initially, the research began with worldwide educational data. However, because of the sheer amount of variables that can affect education worldwide, we decided to narrow the scope of the research to just New York State, a region with educational standards supervised by one government entity, the New York State Education Department (NYSED).

The NYSED releases data on graduation rate, dropout rate, and other outcome data for each school per district on the data.nysed.gov website. The website also includes student body demographics and amount of money spend on each student per district. The US census Bureau provided median income by zip code. Knowing this, we found a table to convert zip codes to school district. We then found data from New York State that provided us with the federal budget provided to each school district, however NYC was not separated out by district. In order to keep NYC on a district level we found separate sources that provided the total funding per NYC school district.

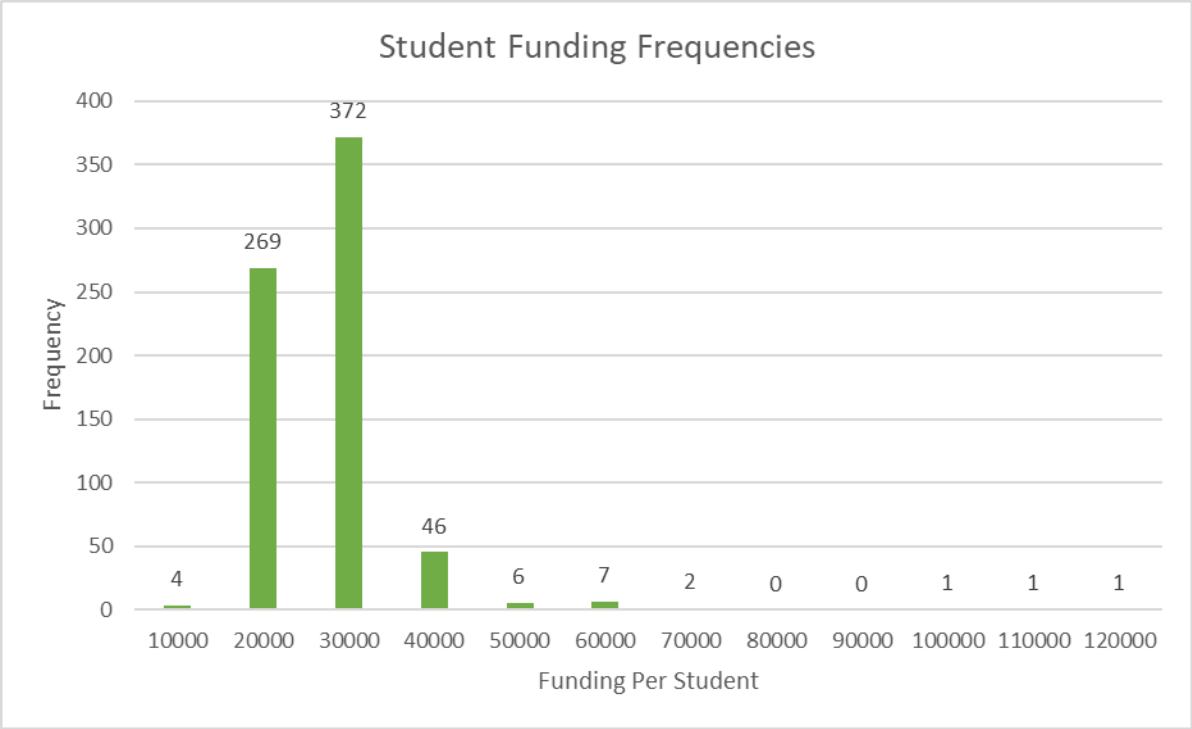
To assess whether the datasets are usable for the purposes of this project, exploratory data analysis was conducted on the datasets. After leaving only relevant columns, data columns were assessed for frequencies in a histogram.

From web scraped district data:



Average dropout rate: 4.77%
Average graduation rate: 88.5%
Average percentage of minority students: 26.9%

From median income (district to zip code to median income mapping):

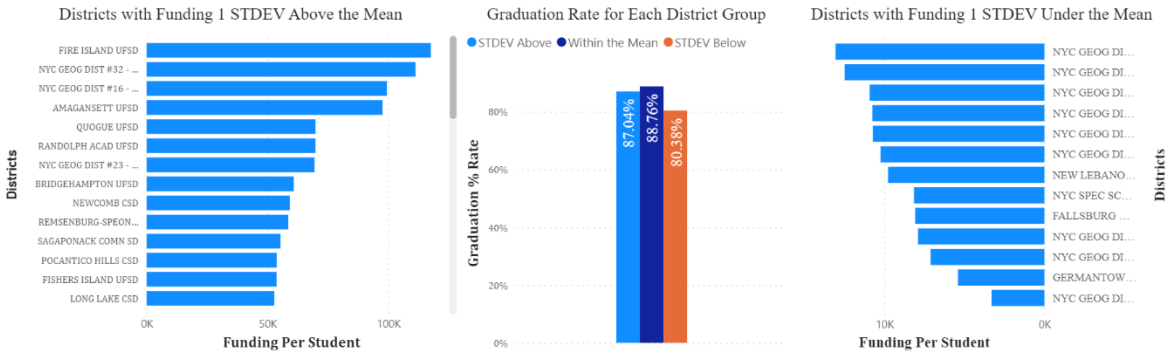


Average median income for all districts: $77,873

Conclusion:

Wraps up research and ties back to exploratory questions

1. Which districts have the most funding per student and what differentiates them from the other districts? Is there a difference in graduation rate for these districts compared to the ones that don't receive as much funding?



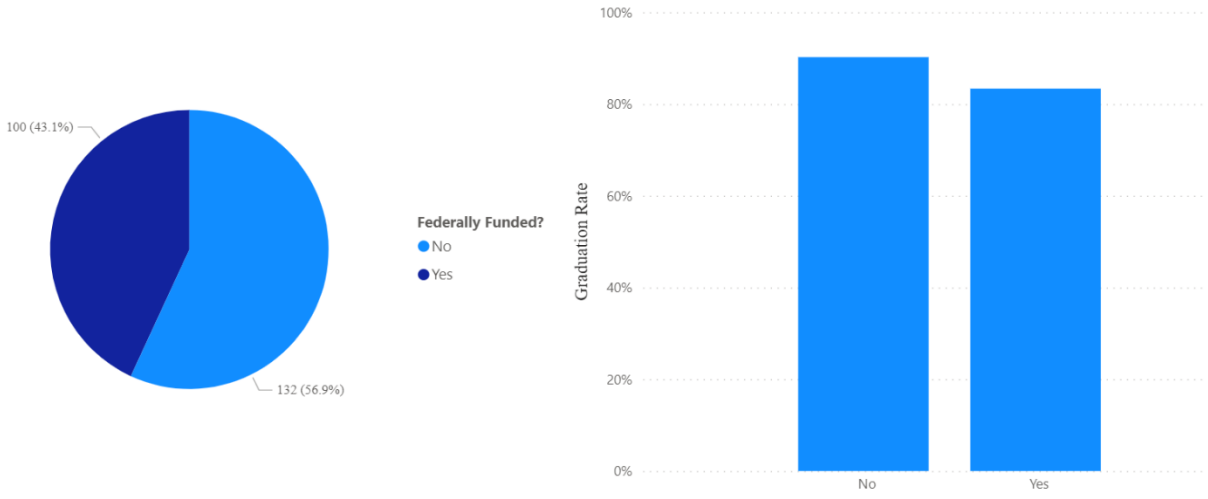
In this visualization, the districts with the most funding, and the districts with the least funding are found by plotting the districts with funding per student over one standard deviation from the mean funding per student.

Taking a closer look at the districts with the most funding, the school district with the most funding is Fire Island UFSD. This school district spends $117,684 per student and has a graduation rate of 96%. Some schools in the high funding per student category are like Fire Island UFSD, in that they have a high funding per student and a high graduation rate. However, the NYC Geographic Districts do not follow this trend. While NYC Geographic District #32 spends $111,293 per student, it has a graduation rate of 75%.

The NYC Board of Education is most likely distributing funding based on student needs. NYC School Districts show up in both the high funding and low funding category bar charts. However, the performance of NYC School Districts in the high funding bar chart are noticeably lower than the performance of NYC School Districts in the low funding bar chart. A particularly extreme example of this is NYC Geographical District #23, which has $69,436 in funding per student, with a graduation rate of 52%. On the other hand, the NYC Geographical Districts in the low funding category bar chart have noticeably lower funds per students, ranging from $13,050 to $3,298, and graduation rates closely clustered around the mean graduation rate of 80.38%.

The bar chart in the center shows that high funding per student and student outcomes do correlate. The general trend is that as funding increases, graduation rate is expected to increase. A reasonable explanation for why the graduation rate for high funding schools is lower than the graduation rate of schools within one standard deviation of the mean are the schools receiving high funding because of high need, like the NYC Geographic Districts with high funding with low graduation rates.

2. What is the percentage of districts that get federal funding vs ones that do not? How do the districts that received federal funding compare to the ones that didn't?

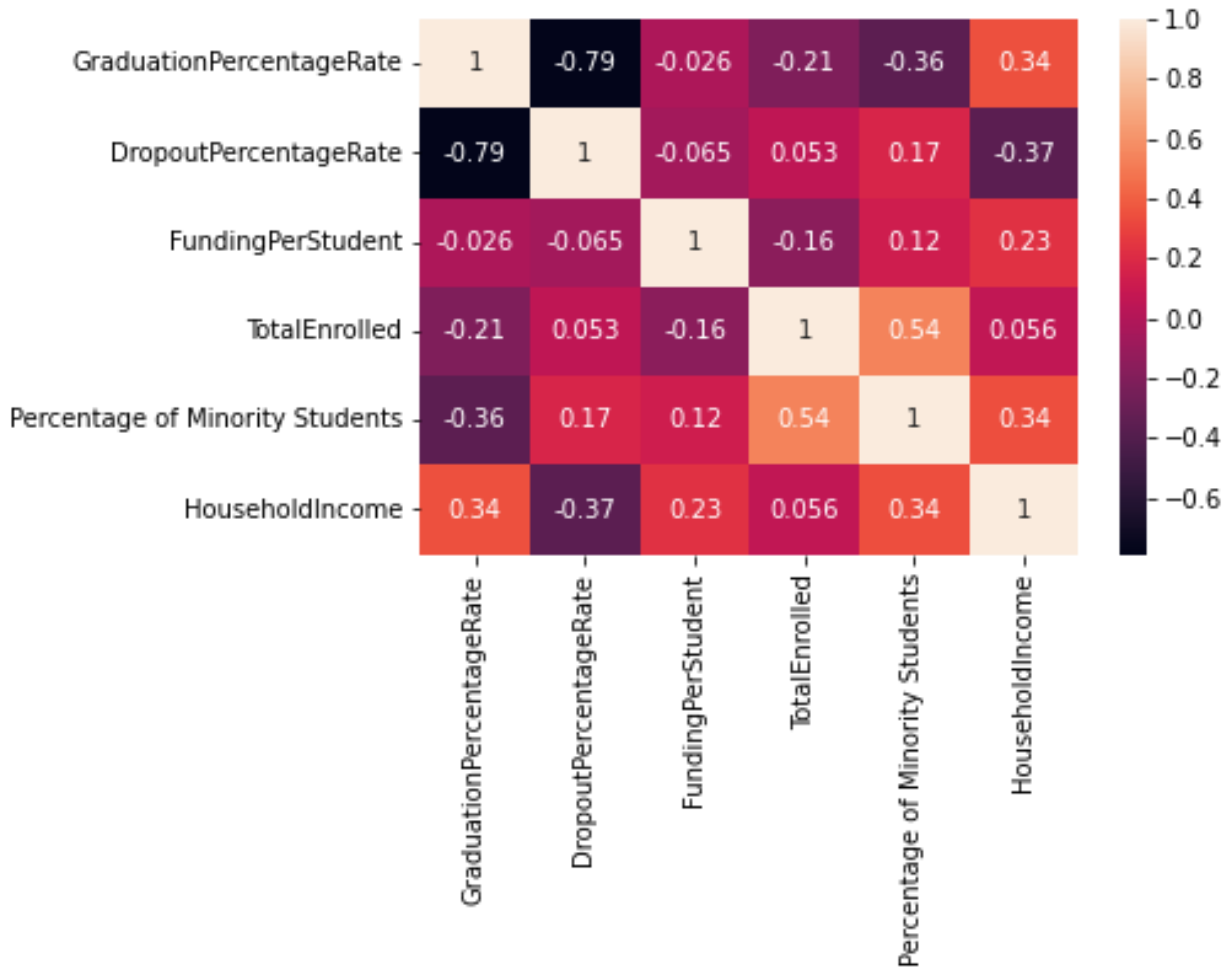


FederallyFunded	Avg Minority Percent	Avg Funding per Student	Avg Household Income	Avg Graduation Rate
	19.95	24,039.63	74,847.99	88.28
No	35.71	21,962.98	95,075.41	90.24
Yes	50.52	19,269.03	68,504.29	83.27
Total	**27.09**	**22,980.14**	**77,834.90**	**87.92**

The dataset of federally funded schools contains only 223 school districts in New York State. 487 school districts do not contain information on whether or not they are federally funded. Of the included 223 school districts, a little under half of them receive federal funding, while the rest do not receive federal funding.

Taking a look at the bar chart, the average graduation rate of federally funded school districts is lower than that of non-federally funded school districts by about 7%. Furthermore, looking at the pivot chart of average percent of minority students, average funding per student, average household income by federal funding status, the federally funded school districts have more minority students (25%), lower funding per student (by $2700 on average), and lower household income (by $26500 on average) as well. This shows that federal funding is most likely to be distributed according to the needs of the school district. Federal funding goes to support schools with less graduating students, where the average household income is a lot lower.

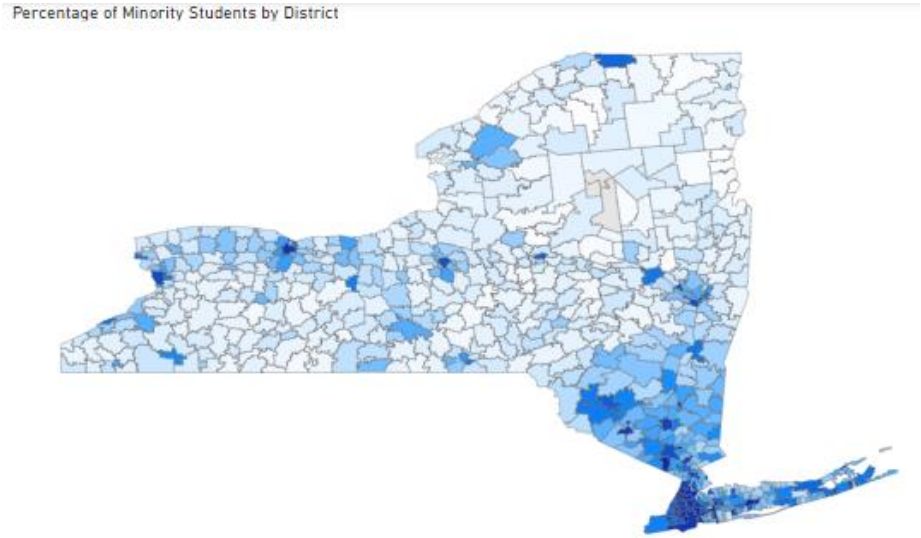
3. What kind of correlation is there between the graduation rate and the other factors we've acquired?



According to this correlation matrix, the items with highest correlation are total amount of students and graduation rate, total enrollment and funding per student, percent of minority students

and graduation rate, percent of minority students and total enrollment, graduation rate and household income, funding per student and household income, and percent of minority students and household income.

Total enrollment for a school district can be thought of as an indicator for how sparsely populated a region is, or if it is urban, suburban, or rural. From this map of school districts in New York State and percentage of minority students, it can be seen that the darkest blue areas, with the highest minority students, center around cities and urban centers, going from around 80% in cities such as Buffalo City, Rochester City, Syracuse City, with the highest concentration around New York City, to close to 0% in other parts of the state. Overall, the correlation between total enrollment and percent of minority students shows that there is a higher minority population in cities and other densely populated areas as compared to more rural areas.



There is a relatively high negative correlation between total enrollment and graduation rate. When taken into account with the similar negative correlation between total enrollment and funding per student, it seems that as the total number of students in a district increases, the less resources and support can be provided to each student.

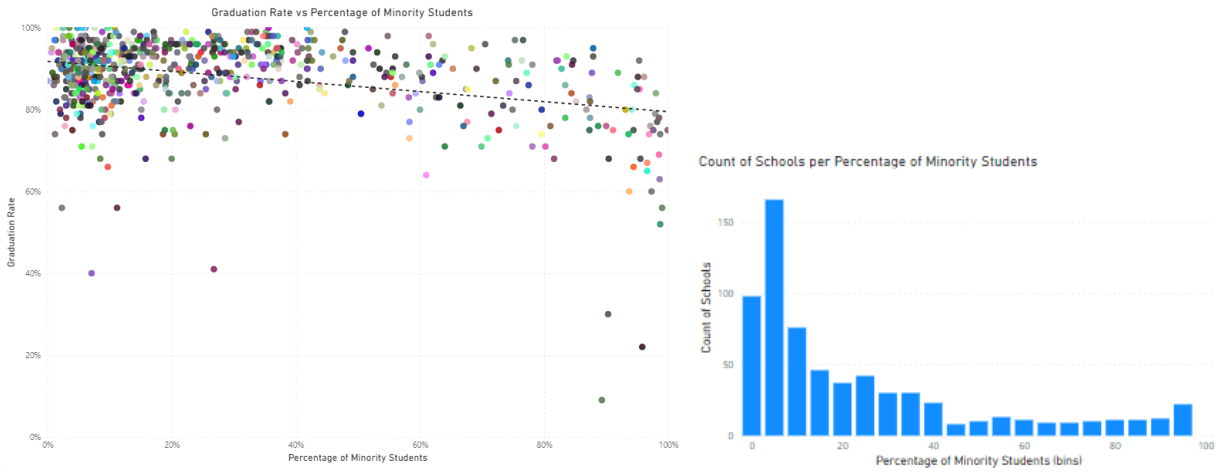
Another interesting correlation is everything involving household income. A higher household income correlates positively with graduation rate, minority student percentage, and funding per student. It also correlates negatively with dropout rate.

The correlation with household income and funding per student can be attributed to how schools (especially not in the cities) are majority funded by local revenue, which consists of taxes, mostly property taxes (NCES). As an area is richer or the land is evaluated at a higher price due to desirability, the amount of money funding each school increases, which increases the funding per student.

The correlation with household income and graduation rate could be because of a few reasons. Students in poorer families may start working sooner or have more need to support themselves and their families. Time spent in schooling is a lost opportunity cost when compared to immediately earning money by working a job. Students living in poorer communities could be exposed to more dangerous conditions than their richer counterparts, and will be less able to pay for resources or outside help like

tutoring. Living in impoverished neighborhoods leads to a higher risk of mental illness and adverse medical outcomes (Georgia Tech). These factor can all affect student performance in schools.

4. Is there a discrepancy between the graduation rate and the percentage of minority students in a district?



The scatter plot of percentage of minority students vs graduation rate shows a negative trend, showing that in districts with more minority students, the graduation rate decreases. There is not enough data in this plot to say that this is a causation, seeing as higher percentages of minority students also correlates with lower household median income, and lower funding per student, as shown previously. The histogram distribution shows that most school districts have a low percentage of minority students.

5. Can we predict the graduation rate for a district based on the data and which factor has the most effect on the graduation rate for a school district?

Recommendations made

Sources:

NCES: [Public School Finance Programs of the United States and Canada: 1998-99]

GATech: [Final Paper(1).pdf (gatech.edu)]